DEPARTMENT OF THE NAVY
NAVAL MEDICAL COMMAND
WASHINGTON, D.C. 20372-5120

IN REPLY REFER TO

NAVMEDCOMINST 6260.12 CH-1
MEDCOM-242
3 Apr 87

NAVMEDCOM INSTRUCTION 6260.12 CHANGE TRANSMITTAL 1

From: Commander, Naval Medical Command
To: Ships and Stations Having Medical Department Personnel

Subj: PREVENTION OF COLD INJURIES

1. Purpose. To correct stock number for NAVMED 6500/1, Report of Heat/Cold Injury.

2. Action. Make the following pen change to the basic instruction: Paragraph 4. Change "S/N 0105-LF-206-5005" to read "S/N 0105-LF-206-5006."

3. Cancellation. This change transmittal is canceled upon completion of required action.

D. E. SHULER
Acting

Stocked:
CO, NAVPUBFORMCEN
5801 Tabor Ave.
Phila., PA 19120-5099

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19 Feb 87

NAVMEDCOM INSTRUCTION 6260.12

From: Commander, Naval Medical Command
To: Ships and Stations Having Medical Department Personnel

Subj: PREVENTION OF COLD INJURIES

Ref: (a) NAVMED P-5010-3, Manual of Naval Preventive Medicine, Chap. 3 - Ventilation and Thermal Stress Ashore and Afloat (NOTAL)
(b) NAVMED P-5052-29, Cold Injury (NOTAL)
(c) NAVEDTRA 10519, Clinical Aspects of Cold Weather Operations (NOTAL)

Encl: (1) Essential Information Regarding Prevention of Cold Injuries

1. Purpose. To provide information in the prevention of cold casualties.

2. Background. Personnel exposed to cold environments risk the development of various injuries and illnesses. These include temporary or permanent disabilities, loss of time from duty, and possible death. Inadequate training, insufficient equipment, and improper physical condition increase the susceptibility to cold illness and injury. Further information is provided in referenced documents, regarding thermal stress (reference (a)), cold injury (reference (b)), and clinical aspects of cold weather operations (reference (c)). References (a) and (b) are available from the Naval Publications and Forms Center, Philadelphia, PA 19120-5099. Reference (c) is available from the Naval School of Health Sciences, Correspondence Course Division, Bethesda, MD 20814-5033.

3. Action

a. Where indicated, personnel must be informed of the practical aspects of preparation for duty in a cold environment as described in enclosure (1).

b. Commanding officers will report to COMNAVMEDCOM (MEDCOM-02) and Naval Safety Center all casualties due to cold on NAVMED 6500/1, Report of Heat/Cold Injury (report control symbol MED 6500-2).

4. Form. NAVMED 6500/1 (Rev. 6-85), Report of Heat/Cold Injury, S/N 0105-LF-206-5005, is available from cog 1I stock points of the Navy supply system and may be ordered per NAVSUP P-2002.

J. S. CASSELLS

Stocked:
CO, NAVPUBFORMCEN
5801 Tabor Ave.
Philadelphia, PA 19120-5099

ESSENTIAL INFORMATION REGARDING PREVENTION OF COLD CASUALTIES

1. Body Heat and Environment. Body heat is regulated by a complex interaction of factors including temperature, air movement, humidity, and radiant heat, as well as the individual's physiologic and behavioral responses. Changes in body temperature are the result of a balance between heat production and heat losses. The human body operates at peak efficiency within a narrow temperature range around 98.6° F (37° C), while the shell extremity temperature may fluctuate safely through a much wider range. The thermostat that controls body temperature is located in a part of the brain called the hypothalamus. Internal body temperature is regulated by control of blood flow from sites of heat production to the body surface. Body heat is produced by combustion of pure substrates such as carbohydrates, fats, and proteins. If the heat of the body is to remain constant, the heat produced and the heat gained must equal the heat lost. Metabolic heat production, plus or minus radiant, conductive, and convective heat exchange, minus evaporative heat loss equals the storage of heat in the body.

2. Nature of Cold Injury

a. Cold injury and illnesses have a worldwide distribution. The physiologic effects of cold exposure include mechanisms designed to conserve energy and increase body heat production. These include superficial constriction of the blood vessels, increased concentration of the blood, increased muscular activity (shivering), and increased oxygen consumption. If body temperature cannot be sustained, various degrees of hypothermia and surface tissue injuries develop. The ability of the body to respond to cold is modified by factors such as age; grade or rate; history of previous cold injury; fatigue; other injuries and illnesses; discipline; training and experience; race and area of origin; drugs and medications, including alcohol and tobacco; activity; psycho-social factors; and the state of hydration. Heat loss is strongly affected by the wind chill factor, which is a measure of the combined effects of wind and temperature, and by conductive loss due to immersion in cold water.

b. The types of cold injuries are nonfreezing and freezing. Nonfreezing injuries, which occur with environmental temperatures above freezing, are chilblains, immersion injuries, and hypothermia. Freezing injuries (frostbite) occur when environmental temperatures fall below freezing. Other common conditions that may occur during cold weather operations are acute mountain sickness, carbon monoxide poisoning, snow blindness, and constipation.

c. Chilblains (Pernio) is a superficial tissue injury which occurs after prolonged or intermittent exposure to low but nonfreezing temperatures and high humidity. Chilblains are characterized by initial pallor. After rewarming there may be erythema, edema, and itching.

d. Immersion injuries result from prolonged exposure to cold water, usually 12 hours or longer at temperatures of 50-70°F (10-21°C) or for shorter periods at or near 32°F (0°C). Trenchfoot is a similar pathological condition seen in trench warfare where mobility is limited and dry boots and socks are unobtainable. The injured part is cold, swollen, waxy-white, with cyanotic burgundy-to-blue splotches, the skin is anesthetic and deep musculoskeletal sensation is lost.

e. Hypothermia is a reduction of the body's core temperature below its normal level (98.6°F or 37°C), which results in a progressive deterioration in cerebral, musculoskeletal, and cardiac functions. Four degrees of severity are recognized and defined by core temperatures: (1) Mild 95-89.6°F (35-32°C), initially characterized by violent shivering followed by virtual cessation of effective muscular activity, disorientation and disinterest in surroundings. (2) Moderate 87.8-82.4°F (31-28°C), with cardiac irregularities occurring at about 86°F (30°C). (3) Deep 80.6-77°F (27-25°C), with corneal reflexes absent below 82.4°F (28°C) and with ventricular fibrilation a paramount risk below 80.6°F (27°C). (4) Profound hypothermia below 77°F (25°C), in which the patient may appear clinically dead. Because patients have been successfully resuscitated at core temperatures of 64°F (18°C), the axiom to be remembered is, "No one is dead until he is warm and dead."

f. Freezing injuries and frostbite result from exposure to temperatures below freezing. The speed of onset, depth, and severity of injury depend on temperature, windchill, and the duration of exposure. Cellular injury and death occur from cellular trauma due to ice crystal formation and from complex vascular reactions occurring in cold exposure. Superficial frostbite involves only the skin or the tissue immediately beneath it, while deep frostbite also affects the deep tissue beneath (including the bone). If the tissue has frozen, it appears "dead white" and is hard or even brittle. Differentiation of the types and severity of injury may be difficult even after rewarming has occurred. Definitive classification of severity is possible only in retrospect, after the case is completed. First degree frostbite is similar to mild chilblain with hyperemia, mild itching, and edema; no blistering or peeling of skin occurs. Second degree frostbite is characterized by blistering and desquamation. In Third degree frostbite there is necrosis of skin and subcutaneous tissue with ulceration. In Fourth degree frostbite, destruction

of connective tissues and bone occurs, accompanied by gangrene. Secondary infections and the sequelae noted for nonfreezing injuries are not infrequent, particularly if there is a history of freeze-thaw-refreeze.

3. Susceptibility of Personnel

a. Adaptation. Acclimatization for 1-4 weeks enables the body's physiologic mechanisms to adapt to the cold environment. The cold adapted person conserves heat better, shivers less, and functions more efficiently in the cold.

b. Age is not a significant problem within the usual range of combat personnel, although very young children and the elderly are more susceptible to cold injury.

c. Grade or rate is significantly associated with cold injury in that front line riflemen have a higher risk of immersion foot and frostbite than higher ranks.

d. Previous cold injury produces susceptibility to recurrent injury.

e. Fatigue can cause carelessness and increases the risk of cold injury.

f. Other injuries or illnesses increase the risk of occurrence and the severity of cold injury, including injuries that cause tissue damage, blood loss and hypovolemia, and febrile illnesses that interfere with normal temperature regulating mechanisms and predispose to hypothermia.

g. Discipline, training, and experience are important factors in prevention of cold injury. Poorly motivated, negative individuals tend to be less active, pay less attention to personal care needs, and are more susceptible to cold injuries.

h. Race and Area of Origin. Although the mechanisms are unclear, Caucasians from U.S. climates with minimum January temperatures above 20°F (-7°C) and American Blacks appear to share an increased hazard of developing cold injury.

i. Activity. Too great or too little activity may contribute to cold injury. Overactivity may cause loss of body heat through perspiration. Immobility causes decreased heat production.

j. Drugs and Medications. Drugs which affect peripheral circulation or perspiration modify the response to cold, and must be used with caution. Phenothiazides and barbiturates can modify shivering and states of awareness, and predispose to cold injury.

The use of tobacco is discouraged during cold weather operations because of its vasoconstricting effect, and is forbidden in the treatment of frostbite. Alcohol has more disadvantages than advantages, because its vasodilatory effect robs the body's core of an essential protective mechanism and produces a detrimental distortion of judgement.

k. Nutrition. Starvation or near starvation diets predispose to cold injury.

l. Water. Water deprivation will cause more problems than lack of food, causing an increased risk of frostbite and impairment of judgement. It may lead to severe gastrointestinal problems and hypothermia.

4. Preventive Measures. Cold injuries are avoidable by proper use of preventive measures that are inspected and enforced by officers and noncommissioned officers.

a. Windchill is defined as the number of calories lost during 1 hour from a square meter of a surface kept at 91.4°F (33°C). A temperature of 20°F (-7°C) and wind speed of 45 miles per hour produce the same effect as a temperature of -20°F (-29°C) and a wind speed of 4 miles per hour, a loss of 1400 kilo calories per hour. Exposed flesh may freeze in 1 minute at a temperature of 15°F (-9°C) at wind velocity of 25 miles per hour. Helicopter downwash converts a calm day into a windy one, and can cause instant frostbite. All individuals going to the cold environment should be aware of the following windchill chart and use protective measures that are appropriate for the equivalent temperature:

Estimated wind speed (in mph)	Actual Thermometer Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	EQUIVALENT TEMPERATURE (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-124
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-21	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER (for properly clothed person) Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh.				GREAT DANGER			

b. Personal Clothing. Proper clothing is required to insulate the body designed to allow ventilation and protect against heat loss. The layering principle is used. The inner layer is porous, with numerous air pockets, while outer layers minimize displacement of body-warmed, trapped air. Moisture and the mineral salts present in sweat reduce the insulating qualities of clothing. The full cold weather clothing allowance permits the layering principle to be used for both the wet cold environment (down to 14°F) (-10°C) and dry cold (below 14°F) (-10°C). Protection of the feet is most important. Cold weather footgear uses the layering principle in black or white rubber vapor barrier (VB) boots, which are effective down to -45°F (-43°C). These boots are worn with one pair of wool cushion-soled socks. It is currently recommended that the socks be changed and dried about 4 times a day, although some authorities accept a daily change of socks as adequate.

c. Meterological Data and Tactical Situations. All commanders should be familiar with simple meterological data, such as humidity, temperature, wind, and ground surface conditions, which influence the risk of cold injury. Clothing needs and periods of exposure can thus be planned to reduce the risk of cold injury. Cold injuries will be more prevalent in fighting forces who are not in control of the tactical situation.

d. Nutrition and Activity. Normally, a caloric intake of 3500 calories per day will be adequate, but the work involved traversing snowy areas uses 4500-6000 calories per day. Carbohydrates and fats are the preferred sources for energy production.

e. Water. With only light activity in the low humidity of Arctic air, a person will lose between 2 and 3 liters of water daily. Adequate intake of potable water must be ensured, and is monitored by checking the "snow flowers" or "snow spots," which are the marks made by urinating in the snow. Snow is generally contaminated by airborne dirt and animal excrement, and must not be eaten for water replacement. If snow is used, it should be boiled or chlorinated properly after melting. Caffeine-containing drinks increase urine output and increase the risk of dehydration. Consuming warm liquids is desirable to protect the core temperature.

f. Training and Discipline. Acclimating to the cold for a period of 1-4 weeks is desirable, during which gradual increase in duration of exposure is accomplished, and proper physical conditioning is ensured. Personnel should be checked daily for personal hygiene, especially of the feet, and for early signs and symptoms of cold injury.

g. Susceptible Groups. Greater protection and supervision should be provided for certain groups of individuals, including the fatigue group, the racial group, the geographic origin group, the previous cold injury group, the negative group, and those with other injuries and illnesses.

5. First Aid. Leaders of small units and groups must be familiar with the symptoms of cold injuries and illnesses and carefully observe their personnel when operating in the cold environment. Treatment of cold injury depends upon the time elapsed after injury, the severity of the injury, the presence of complications, and the area affected. The tactical situation and facilities available will also influence the treatment in military operations, where large numbers of patients may require treatment almost simultaneously. The examination and treatment of life-endangering wounds must take precedence over cold injuries. Primary treatment is divided into buddy system or first aid and initial or emergency medical treatment in forward areas.

a. First Aid or Buddy System

(1) The patient should be restricted from his or her usual duties until the severity of injury can be evaluated. A doctor should see the injury as soon as possible. All constricting items of clothing, such as boots, socks, or gloves should be removed from the site of injury. The injured area must then be protected from further cold injury by blankets and nonconstricting clothing. Smoking, drinking of alcohol, and application of salves or ointments are prohibited. Drinking of hot liquids is encouraged, if the patient is conscious and not otherwise injured or exhibiting moderate to severe hypothermia. In unusual circumstances where travel on foot is the only means of evacuation for frostbite of the feet, thawing of the injured area is not indicated until the patient reaches an aid station and medical help. Light cases of superficial frostbite may be treated by placing the injured part against the warm skin of the crotch, armpit, or abdominal skin of the patient or a buddy. Intense pain and hyperemia occur on rewarming and may persist for several hours but gradually disappear. More severe cases should be treated only at a medical facility.

(2) Hypothermic patients should be moved promptly to the battalion aid or clearing station for treatment. Mild hypothermia victims can walk on their own and speak lucidly, and can be rewarmed promptly at the battalion aid station. More serious cases must be protected from further heat loss and transported to the battalion aid station for evaluation, with transportation conducted with care to prevent ventricular fibrillation. Depending on the depth of hypothermia found to be present, moderate and severe hypothermia patients will be rewarmed at either the clearing station or a field hospital.

b. Initial or Emergency Treatment (Battalion Aid Station)

(1) Frostbite is treated by rapid rewarming in a water bath carefully controlled at 104°F (40°C), not to exceed 109°F (43°C). The water bath must have thermometer temperature control. Rapid warming should not be continued beyond the time when thawing is complete and should not be instituted if thawing has already occurred. Nonfreezing injuries should not be warmed above 98.6°F (37°C). Smoking is prohibited. Alcohol is not recommended. Narcotics and other pain medications are not contraindicated, except where other injuries are present. All patients with cold injuries of the lower extremities are litter patients. Blisters and blebs should not be ruptured, and the affected part should be carefully protected with loosely wrapped sterile fluff bandages during transportation. Tetanus Toxoid is administered. Prophylactic antibiotics are not recommended.

(2) Hypothermia is assessed using a low temperature thermometer, or the clinical indications of level if temperature monitoring is not possible. Individuals with hypothermia of moderate, severe, or profound levels should be protected against further temperature loss and moved carefully to a clearing station or field hospital. Only cases of mild hypothermia (95°F to 89.6°F (35°C to 32°C)) should be treated at the battalion aid station, because of the risk of ventricular fibrillation and other complications that may occur during rewarming. If there is any question whether victims are more than mildly hypothermic, evacuate them to the clearing station.